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GENERAL NOTES.

Death of Dr. Lewis Swift.—It is with great regret that we record here the death of this veteran astronomer on January 5th at his home in Marathon, New York. Dr. SWIFT lacked but a few weeks of being ninety-three years of age; he was born at Clarkson, New York, on February 29, 1820. As an astronomer and scientist, Dr. SWIFT was largely self-educated. When a young man he became greatly interested in scientific matters, and devoted himself for some time to the lecture field, traveling about and lecturing upon electricity, then a comparatively new subject. He afterwards entered the hardware business, but found time to continue his astronomical work at the same time, discovering several comets. Moving to Rochester, he set up his small telescope on the roof of an old cider mill, and his cometary discoveries attracted the attention of H. H. WARNER, a wealthy manufacturer of proprietary medicines. Mr. WARNER built for Dr. SWIFT the Warner Observatory, in which was installed an 18-inch refractor, whose cost was met by popular subscription by the citizens of Rochester. Financial reverses later compelled Mr. WARNER to withdraw his support, and Dr. SWIFT then took this telescope to the Lowe Observatory, in Southern California, where he remained till failing eyesight compelled him to withdraw from all astronomical work.

Dr. Swift discovered fourteen comets and over thirteen hundred new nebulæ, and it is from his work in these fields that his name is best known. He was one of the very few astronomers who have had the privilege of seeing Halley's Comet at two successive apparitions. He was a Fellow of the Royal Astronomical Society, and was the recipient of numerous medals for his cometary discoveries. He was almost entirely deaf, but overcame this obstacle to his scientific work with characteristic ingennuity by placing a small induction coil in circuit with his clock, so that at each tick a slight shock was sent through his arm. His last years were spent in retirement from all active duties, at the home of his daughter in Marathon Though both hearing and sight had now failed him, he never ceased to manifest a keen interest in the progress of his favorite science.

Eclipses in 1913.—There will be three solar eclipses in 1913, but all of them will be partial eclipses and of no particular interest astronomically. These partial eclipses will take place on April 6th, August 31st, and September 29th. For the eclipse of April 6th, the eclipse area extends just south of San Francisco, but the amount of obscuration will be too slight to be noticed without telescopic aid. The other two will not be visible at all from the United States. There will be two total lunar eclipses. That of March 21st-22d will be visible in California, the middle of the eclipse coming a few minutes before 4 A. M. on the morning of the 22d. The beginning of the lunar eclipse of September 14th-15th will be visible in California, but not the total phase.

The trustees of Wesleyan University have voted to build an astronomical observatory at a cost of $60,000.—*Science,* November 15th.

The next meeting of the International Union for Solar Research will be held at Bonn, beginning August 1, 1913. The Astronomical and Astrophysical Society of America will hold no summer meeting in 1913, because of the probable absence of a number of its members at the Bonn conference. The summer meeting of 1914 will be held at Northwestern University, and that of 1915 in San Francisco and at the Lick Observatory.

The great 100-inch disk of glass for Mount Wilson was at first rejected because of flaws. After a number of attempts to secure a more perfect disk of the requisite thickness had failed, it was decided to make the attempt to figure and polish the disk on hand. We learn from *Popular Astronomy* that recent tests unfortunately show that this disk is probably useless, as was feared, and the completion of the great reflector seems therefore to be only a hope of the distant future, depending on the securing of a more perfect disk of glass. It is said that a perfect disk eight inches thick has been cast, but this is believed to be relatively too thin to promise a successful mirror. The casting and proper annealing of so great a disk appears to be fully as difficult a matter as in the case of great lenses.

There are at least four or five large lenses which have now been delayed a year or more awaiting the successful casting of the glass disks. It will be remembered that there were at least nineteen failures before the crown glass disk for the Lick refractor was secured.

Dr. C. D. PERRINE, director of the National Observatory at Córdoba, Argentina, has placed orders with the Alvan Clark & Sons Corporation for a 24-inch, a 12-inch and several other objectives.

Professor M. ANDOYER, of the Nice Observatory, has been chosen to succeed POINCARÉ in the professorship of mathematical astronomy at the University of Paris.

On January 6th and 7th a cold wave struck California which was responsible for the breaking of many low-temperature records throughout the State and did considerable damage to citrus fruits. At Mount Hamilton the weather was marked by perfectly clear skies, with a north wind of from forty to sixty miles per hour and a minimum temperature of 11°.5 Fahrenheit, which is believed to be the lowest temperature ever recorded at the observatory.

An International Time Conference was held at Paris in October, to which delegates were sent by the principal governments of the world. The subjects discussed by the four commissions, into which the conference was divided, were as follows:—

1. The astronomical determination of time, and the correction of time-keepers.
2. Radio-telegraphic transmission of time. Apparatus to be used for sending and receiving hourly signals.
3. The degree of precision that ought to be reached in the hourly signals for different purposes; for astronomy and geodesy, navigation, meteorology, seismography, and various scientific applications; for railways, public administration, and clock-makers.
4. Collaboration of different astronomical centers to insure the best knowledge of time.

Consideration of the general organization necessary to provide for the transmission as well as the reception of hourly signals, so as to satisfy all wants.

International meteorological telegrams.

A scheme was put forward to be submitted to the governments represented for the establishment of a "Commission Internationale de l'Heure," with an executive "Bureau Internationale de l'Heure" located at Paris. It was agreed:—

1. To use Greenwich time;
2. To send out the signals at exact hours;
3. To arrange that there shall be no overlapping.
4. To determine the most suitable wave-length to be employed.

As to the sending of the signals, it was proposed that signals should be sent by radio-telegraphy from stations around the globe, so chosen that any place on the Earth should be able to receive a day signal and a night signal. Nine such stations have been selected, and the time for sending out signals determined, each signal extending over three minutes before the end of some hour by Greenwich time.

Sir George Howard Darwin.[1]—Science is the poorer, and especially that branch of it in which Englishmen since NEWTON'S days have held a prominent position, astronomical physics, by the death of Sir GEORGE DARWIN, K.C.B., F.R.S., D.SC., LL.D., the Plumian Professor of Astronomy at Cambridge. Sir GEORGE, who underwent a serious operation two months ago, passed away on December 9th.

Sir GEORGE DARWIN was the distinguished son of a most distinguished father. CHARLES DARWIN, prince of naturalists, died in 1882, honored in every land where science is cultivated, but untitled in his own. He left five sons—WILLIAM ERASMUS, GEORGE HOWARD, FRANCIS, LEONARD, and HORACE, and two daughters. It is the second of these sons, GEORGE HOWARD, who has now passed away. Of his family, all of them intellectual and scientific, GEORGE HOWARD least resembled his father in his favorite studies and research. CHARLES DARWIN used to confess with regret his ignorance of mathematics. That was not much for one who was equally ready to profess deficient knowledge of botany, of which he might have been a professor in any university, but in the case of mathematics it was perhaps true. He declared, indeed, that he never understood an equation, and he deplored the ignorance because that science seemed to endow men with a special faculty. His son, now no more, was one of the great mathematicians of his day, who, curiously enough, used to say that he knew very little of those biological studies which his father had enriched for all time.

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[1] From the *London Daily Telegraph.*

GEORGE HOWARD DARWIN was a native of Down, in Kent, that pretty, antique village, whither naturalists from the ends of the Earth resort to see the place where the "Origin of Species" was written. The house is still there, but it is, we believe, now a ladies' school. There, on July 9, 1845, the future mathematical physicist was born. Except in scientific circles his father was little known, save perhaps as the author of the "Voyage of the Beagle," and few of those who then read that wonderful book could have any idea how great a work it was.

When only 23 years of age GEORGE granduated Second Wrangler and Second Smith's Prizeman. He was thus among the list of the greatest physicists of the nineteenth century who were Second Wranglers—Lord KELVIN, CLERK MAXWELL, and J. J. THOMPSON among them. In the same year he was elected Fellow of his college. Curiously enough, he became a barrister in 1874, recalling the fact not generally known that the greatest of the world's mathematical physicists narrowly escaped being a lawyer. When ISAAC NEWTON came to London he was poor. On account of that poverty he offered to resign his fellowship of the Royal Society, but the good secretary OLDENBURG discerned the reason and "Mr. NEWTON'S" annual fee to the Royal Society was remitted. He had serious thoughts of becoming a lawyer. Presently he became Lucasian Professor at Cambridge; his "bread and cheese" were secured, and the world of science was spared a disaster.

In the year 1883 GEORGE DARWIN was elected Plumian Professor of "Astronomy and Experimental Philosophy" at Cambridge.

GEORGE DARWIN had already, at the date of his succession to the professorship, done good work. In 1880 he had traced back, by a process of abstruse reasoning, the history of the Moon and its relationship to the Earth, and demonstrated that in all probability there was a time when the Earth-Moon system was one body, and that a crisis came when the Earth—not then the rigid body it is now, but rotating much more rapidly—threw off a part of its substance into space and so formed our satellite. When that event happened there started the species of attraction between the two bodies which, in its widest and most generalized sense, is known as "tidal."

The theory of the tides and its application not merely to the great oceans of our own globe, but still more to stellar worlds—some of which are still in their earlier stages of existence—have been, perhaps, the crowning work of the great physicist now no more. It belongs to the romance of scientific speculation, to the most sublime of astronomical hypotheses.

RIGIDITY OF THE EARTH.

One of the difficulties in the problem of the tides arises from the rigidity of the Earth. We know that the waters of the ocean rise and fall in obedience to tidal attraction; yet few people realize how many hundreds of millions of tons of water every day enter the English Channel, the North Sea, the Thames, and Severn, and all our other seas and estuaries—to say nothing of the great oceans, through the pull of the Moon's attraction. Does the solid surface of the globe itself yield to the same force? This is a question still unanswered. The late Lord KELVIN and Sir GEORGE DARWIN studied this problem profoundly. They came to the conclusion that our solid globe must be, as a whole, as rigid as glass or steel, otherwise visible earth-waves due to tidal gravitation would be formed on its land surfaces. It is now generally believed that the Earth does yield slightly to these tidal forces, and this hypothesis has been brought forward as a possible contributing cause of earthquakes, but so far without confirmatory evidence. Sir GEORGE and Lord KELVIN came to the conclusion that "the effective rigidity of the Earth must be greater than that of glass—and probably as great as that of steel." An old theory of some geologists assumed that the Earth was practically a hollow sphere with a solid crust. Sir GEORGE DARWIN'S researches corroborated those of KELVIN that this condition was impossible. The Earth is five and a half times as heavy as a globe of water of the same size—as that wonderful recluse, HENRY CAVENDISH, proved in 1798—and could not conceivably be hollow, and besides the idea conflicted with the tidal theories.

AGE OF THE WORLD.

Although a great mathematician and a strong physical reasoner, Sir GEORGE DARWIN had the merit to bear in mind that, as HUXLEY said, what comes out of the mathematical mill depends largely upon what you put into it. The physicist cannot always be certain of his data. Hence he did not commit himself to KELVIN'S theory that the Sun's heat could not have lasted more than a hundred million years, for he saw well enough the reasonableness of the demand of geologists, like his father, for a much longer period. Time justified the caution. Madame CURIE discovered radium. In radium we saw the breaking up of an element, and the evolution of heat-energy never before dreamed of. The geologists won, and now they can have the two hundred million years or more that long ago they deemed necessary.

In regard to another theory, Sir GEORGE DARWIN'S calculations were of service to geologists. What caused the Glacial Epoch? No physical problem is of deeper interest in the story of the Earth. One favorite solution was that the pole of the Earth had changed its place in past times. There were certainly periods when plants grew near the North Pole and near the South Pole, sufficient by their remains to form beds of coal, where to-day there are never-melting ice-caps hundreds of feet thick. But if the poles were not then where they are now, what produced the change? It was suggested that greater accumulations of ice at various times within the polar circles affected the world's gravitation, and shifted the position of the Earth's axis. Sir GEORGE DARWIN proved mathematically that no such distribution of weight would account for a movement of the world's axis, except under other simultaneous conditions, which are practically out of the question, and so the glaciation periods remain unaccounted for.

Researches like those of the late Plumian professor appeal to comparatively few. Such papers as "Harmonic Analysis of Tidal Observations," or the application of spherical harmonics "to determine the stresses caused in the interior of the Earth by the weight of continents and mountains," are beyond most physicists. They engaged GEORGE DARWIN thirty years ago. It would be a mistake to suppose because they seem to-day in some cases of theoretical value only, they are of no practical service. So seemed CLERK MAXWELL's electro-magnetic theory of light forty years ago. It is now the basis of wireless telegraphy. In the sublime field of astronomy GEORGE DARWIN helped the advancement of the theory of evolution in the making of worlds, as his noble father did in the development of organic life.

Robert Gauss.—ROBERT GAUSS, grandson of KARL FRIEDERICH GAUSS, the most distinguished mathematician of the last century, died in Denver on Sunday, January 19th. He had been editorial writer on the Denver *Republican* staff for the past twenty-nine years, and was a man of wide culture in historical and scientific subjects, and a most kindly and lovable character. He had given much time to experiments upon the growth and selection of grains and vegetables under semi-arid conditions of development, and a bill is now before Congress for the establishment of an agricultural station in Colorado to continue the research which he had carried on entirely from his own funds.

He was 61 years of age, and the son of EUGENE GAUSS, formerly of St. Louis. His brother, CHARLES HENRY GAUSS, of St. Charles, Missouri, died within a few hours of ROBERT GAUSS, both brothers from the same cause, heart disease. A sister and two brothers survive them. There are also cousins in this country, descendants of the great German mathematician.

The Lick Observatory possesses a portrait of KARL FRIEDERICH GAUSS, presented by the grandson, ROBERT GAUSS, nearly twenty years ago. There is also a framed autograph letter in our collection, written by the grandfather in 1844 to his son EUGENE, who was married in this country in that year. The letter had been carefully treasured by ROBERT GAUSS until he gave it to the observatory for preservation. R. H. T.